

Express Mail Certificate No. EV298592583US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
APPLICATION FOR LETTERS PATENT

Applicants: CHUN-TIEN CHEN  
PEI-CHIN HUNG  
CHIN-FENG LIU

Title : PNEUMATIC SANDING MACHINE

7 Claims

9 Sheets of Drawings

William E. Pelton  
Reg. No. 25,702  
Donald S. Dowden  
Reg. No. 20,701  
Cooper & Dunham LLP  
1185 Avenue of the Americas  
New York, New York 10036  
(212) 278-0400

# **PNEUMATIC SANDING MACHINE**

## **BACKGROUND OF THE INVENTION**

### **1. Field of the Invention**

The present invention relates to a pneumatic sanding machine, and more particularly to a pneumatic sanding machine that has a control valve that changes movement of exhausting compressed air so that the sanding machine provides a selectable way of dealing with wood-dust or sanding debris caused during sanding.

### **2. Description of Related Art**

Sanding machines, as known as sanders are used to smooth work-pieces, such as wood. A pneumatic sanding machine applies compressed air or pressurized air as a power to actuate the sanding machine working. When a person uses a pneumatic sanding machine to make something smooth, dust and debris will be produced by the sanding operation.

There are three operations introduced into the sanding machines in accordance with the prior art, one of which is not to deal with the dust, the second is to collect the dust into a dust bag and the third way is to vacuum the dust into a vacuum cleaner regarded as a central-aspirated feature. However, each of the stand-alone sanding machines in accordance with the prior art provides only one of the three operation ways to deal with the powder. None of the conventional sanding machines provides all three operation ways such that a person who is using the sanding machine can select a proper way to deal with the dust. Besides, the last two of the aforementioned operations for dealing with the dust involves a lot of parts assembled in the sanding machine and assembly of

1 these parts into the sanding machine requires excessive time. Consequently, the  
2 conventional sanding machine is not only inconvenient to use but also involves  
3 uneconomic fabrication costs.

4 To overcome the shortcomings, the present invention provides a sanding  
5 machine having a control valve that changes a movement of exhausting  
6 compressed air so that a way to deal with the waste material is selectable to  
7 mitigate or obviate the aforementioned problems.

#### 8 SUMMARY OF THE INVENTION

9 The main objective of the invention is to provide a sanding machine that  
10 has a control valve to change a movement of exhausting compressed air simply  
11 so as to have three selectable operation ways to deal with dust and debris caused  
12 by sanding. Another objective of the invention is to provide a sanding machine  
13 that has a simple control valve to change a movement of exhausting compressed  
14 air simply.

15 Other objectives, advantages and novel features of the invention will  
16 become more apparent from the following detailed description when taken in  
17 conjunction with the accompanying drawings.

#### 18 BRIEF DESCRIPTION OF THE DRAWINGS

19 Fig. 1 is a perspective view of a sanding machine in accordance with the  
20 present invention;

21 Fig. 2 is an exploded perspective view of the sanding machine in Fig. 1;

22 Fig. 3 is a partially exploded perspective view of the sanding machine in  
23 Fig. 1;

24 Fig. 4 is an operational, partial cross sectional top plan view of the

1 sanding machine when the sanding machine is operated without a way of dealing  
2 with waste material;

3 Fig. 5 is an operational, partial cross sectional top plan view of the  
4 sanding machine when the sanding machine is operated with a way of  
5 vacuuming the waste material into a vacuum cleaner;

6 Fig. 6 is an operational, partial cross sectional side plan view of the  
7 sanding machine in Fig. 5;

8 Fig. 7 is an operational, partial cross sectional top plan view of the  
9 sanding machine when the sanding machine is operated with a way of sucking  
10 the waste material into a dust bag;

11 Fig. 8 is an operational, partial cross sectional side plan view of the  
12 sanding machine in Fig. 7; and

13 Fig. 9 is a side plan view of the sanding machine in Fig. 1.

#### 14 DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

15 With reference to Figs. 1 and 2, a sanding machine (not numbered) in  
16 accordance with the present invention comprises a body (1), a control valve (30)  
17 and a pneumatic motor assembly (5) that is assembled in a conventional manner  
18 in this art. The body (1) comprises a top cap (10), a motor frame (11), a bottom  
19 annular cover (12), a switch assembly (13), a chamber cover (14) and multiple  
20 connection fittings, such as an intake air connection fitting (15), a vacuum  
21 connection fitting (16) and an elbow connection fitting (17).

22 With reference to Figs. 2 and 4, the motor frame (11) has an annular  
23 portion (110), an upper protrusion (111) and a lower protrusion (112). The  
24 annular portion (110) has an exterior periphery (not numbered) and an inner

1 space (113) with a top opening (not numbered) and a bottom opening (not  
2 numbered). The upper and the lower protrusions (111, 112) are integrally formed  
3 on and extend from the exterior periphery. The top cap (10) is attached to the  
4 annular portion (110) to cover the top opening of the inner space (113).

5 The upper protrusion (111) has a front (not numbered), a rear (not  
6 numbered), two opposite sides (not numbered), an intake air port (114), an intake  
7 air passage (115), an exhausted air passage (116), a valve chamber (117), a  
8 buffering chamber (118) and a connecting passage (119). The front of the upper  
9 protrusion (111) is formed integrally on the exterior periphery of the annular  
10 portion (110) of the motor frame (11). The intake air port (114) and the buffering  
11 chamber (118) are respectively defined in the rear of the motor frame (11). The  
12 intake air passage (115) is defined between the intake air port (114) and the  
13 annular portion (110), is aligned with the intake air port (114) and communicates  
14 with the inner space (113). Likewise, the exhausted air passage (116) is defined  
15 between the buffering chamber (118) and the annular portion (110) and  
16 communicates with the inner space (113). The chamber cover (14) covers the  
17 buffering chamber (118) and has multiple through holes (not numbered) to  
18 permit air to exit the buffering chamber (118).

19 The intake air connection fitting (15) is attached to and held in the intake  
20 air port (114) so that the sanding machine can connect conveniently to a  
21 compressed air source, such as an air compressor (not shown). The switch  
22 assembly (13) is mounted outside of the upper protrusion (111), interconnects  
23 the intake air port (114) with the intake air passage (115) and comprises a  
24 pneumatic switch (131) and a lever (132) pivotally mounted on the upper

1 protrusion (111). Thus, when the lever (132) is pressed, the pneumatic switch  
2 (131) will be actuated by the lever (132) to allow the compressed air to enter the  
3 intake air passage (115) via the intake air port (114).

4         The valve chamber (117) is defined transversally in one of the sides of  
5 the upper protrusion (111) and interconnects the exhausted air passage (116)  
6 with the buffering chamber (118). The control valve (30) is detachably mounted  
7 and held in the valve chamber (117) to change and control the exhausted air  
8 movement. In order to hold the control valve (30) in the valve chamber (117), a  
9 pin hole (1172) is defined longitudinally through the upper protrusion (111) and  
10 communicates with the valve chamber (117), thus a pin (1171) can be inserted  
11 into the pin hole (1172) to hold the control valve (30) in position.

12         With reference to Fig. 6, the connecting passage (119) is defined  
13 longitudinally in the valve chamber (117) and has a bottom opening (not  
14 numbered) that communicates with the bottom opening of the inner space (113).  
15 The elbow connection fitting (17) is fitted into the bottom opening of the  
16 connecting passage (119) and has an air outlet (not numbered). The lower  
17 protrusion (112) is formed integrally on the exterior periphery of the annular  
18 portion (110) and has an air exhausting passage (1121) aligned with the air outlet  
19 of the elbow connection fitting (17). The vacuum connection fitting (16) is  
20 inserted and held in the exhausting passage (1121) and is adapted to connect with  
21 either a vacuum cleaner (not shown) or a dust bag (not shown).

22         With reference to Figs. 2 and 4, the motor assembly (5) is mounted and  
23 held partially in the inner space (113) in the motor frame (11) and comprises a  
24 sanding pad (50), a shaft (51) and a pneumatic motor (52). The sanding pad (50)

1 is for a task of sanding with sanding papers (not shown) and has a top (not  
2 numbered) and multiple powder sucking holes (501) defined through the top.  
3 The powder sucking holes (501) are arranged radially and covered by the bottom  
4 annular cover (12) that is attached to the annular portion (110) of the motor  
5 frame (11) . The shaft (51) extends from the top of the sanding pad (50), connects  
6 to the pneumatic motor (52) and is rotated by the pneumatic motor (52). The  
7 pneumatic motor (52) is assembled in a conventional manner and comprises a  
8 top cover (521), a bottom cover (522), a stator (523), a rotor (524) and multiple  
9 air-actuated blades (525). The stator (523) is mounted and held in the inner space  
10 (113) in the motor frame (11) and has a top (not numbered), a bottom (not  
11 numbered), a rotor space (not numbered), an air inlet (526) being aligned and  
12 communicating with the intake air passage (115) and an air outlet (527)  
13 communicating with the exhausted air passage (116). The rotor (524) is rotatably  
14 mounted in the rotor space of the stator (523), connects to the shaft (51) and has  
15 multiple blade slots (528) that holds respectively the air-actuated blades (525).  
16 The top and the bottom covers (521, 522) are respectively attached to the top and  
17 the bottom of the stator (523) to enclose the rotor space in the stator (523).

18 With reference to Fig. 3, the control valve (30) is detachably received in  
19 the valve chamber (117), has a first end (not numbered), a second end (not  
20 numbered) and comprises a first portion (31), a neck portion (32) and a second  
21 portion (33). The first portion (31) has a first positioning hole (311) defined  
22 radially and which corresponds selectively to the pin hole (1172), and an inclined  
23 surface (312) which forms an elongated covering protrusion (not numbered).  
24 The neck portion (32), which can be a cylinder, protrudes from the inclined

1 surface (312) and connects to the second portion (33). The second portion (33)  
2 has a second positioning hole (331) defined radially and which corresponds  
3 selectively to the pin hole (1172).

4 With reference to Fig. 4, when the sanding machine is operated in one  
5 way without dealing with the waste material, the compressed air is only used to  
6 rotate the rotor (524). In such an operation model, the first portion (31) of the  
7 control valve (30) is inserted into the valve chamber (117) so that the elongated  
8 covering protrusion covers and closes the connecting passage (119). The pin  
9 (1171) is inserted into the pin hole (1172) and extends into the second  
10 positioning hole (331) to hold the control valve (30) in position. The leading  
11 arrows in Fig. 4 indicate the path and movement of the compressed air. The  
12 incoming compressed air flows through the intake air passage (115) entering the  
13 rotor space of the stator (523) via the air inlet (526) to actuate the rotor (524) to  
14 rotate. Then, the compressed air comes out of the rotor space through the air  
15 outlet (527), passes through the exhausted air passage (116) and over the neck  
16 portion (32) and enters the buffering chamber (118) that reduces the compressed  
17 air speed to avoid noise. The compressed air will eventually be exhausted via the  
18 through holes in the chamber cover (14).

19 With reference to Figs. 3, 5 and 6, when the sanding machine as  
20 previously described in Fig. 4 has to be changed to a way of using the central-  
21 aspirated feature of the sanding machine that uses a vacuum cleaner (not shown)  
22 to vacuum the waste material, the vacuum cleaner connects to the vacuum  
23 connection fitting (16) by means of a connecting hose (21). Thus, the waste will  
24 be sucked into the vacuum cleaner through the powder sucking holes (501) and



1 the air exhausting passage (1121) in the lower protrusion (112) as the vacuum  
2 cleaner operates.

3 With reference to Figs. 3, 7 and 8, when the sanding machine has to be  
4 operated in the third way of using a dust bag (20) that connects to the vacuum  
5 connection fitting (16) to collect the waste material in the dust bag (20), the  
6 compressed air is used to not only rotate the motor (524), but also cause a  
7 sucking force to collection the dust. In such an operation model, the control  
8 valve (30) is taken out of the valve chamber (117). Then, the second portion (33)  
9 of the control valve (30) is inserted into the valve chamber (117) to uncover and  
10 open the connecting passage (119), thus the elongated covering protrusion of the  
11 first portion (31) covers and closes simultaneously the exhausted air passage  
12 (116). The pin (1171) is inserted into the pin hole (1172) and extends into the  
13 first positioning hole (311) to hold the control valve (30) in position. Thereafter,  
14 the compressed air that comes out of the rotor space through the air outlet (527)  
15 passes over the neck portion (32) and enters the connecting passage (119) and  
16 eventually travels into the air exhausting passage (1121) in the lower protrusion  
17 (112) through the air outlet of the elbow connection fitting (17) to cause a  
18 sucking force. The waste material is sucked by the force, moved through the  
19 powder sucking holes (501) and enters the dust bag (20) through the air  
20 exhausting passage (1121) in the lower protrusion (112).

21 Furthermore, with reference to Figs. 2 and 9, the waste material will  
22 enter into the valve chamber (117) and may influence the control vale (30) to be  
23 smoothly taken out of the valve chamber (117) after a long-term use of the  
24 sanding machine. Therefore, the upper protrusion (111) further has a side bore

1 (1173) defined in the other side of the upper protrusion (111) where the side bore  
2 (1173) is opposite to the valve chamber (117). The side bore (1173)  
3 communicates with the valve chamber (117) so that the person can conveniently  
4 use a stick (not shown) passing through the side bore (1173) to push the control  
5 valve (30) that is received in the valve chamber (117) out as the control valve (30)  
6 is engaged by the waste material.

7       The present invention simply uses the control valve (30) to control and  
8 change the flowing path of the compressed air in the sanding machine to change  
9 simultaneously the way to collect the waste material. The control valve (30) is  
10 easy to fabricate and convenient to use. Besides, since the sanding machine in  
11 accordance with the present invention has a selectable way of collection, the  
12 sanding machine is more economic than a conventional stand-alone sanding  
13 machine that has only one way of waste material collection.

14       Even though numerous characteristics and advantages of the present  
15 invention have been set forth in the foregoing description, together with details  
16 of the structure and function of the invention, the disclosure is illustrative only,  
17 and changes may be made in detail, especially in matters of shape, size, and  
18 arrangement of parts within the scope of the appended claims.